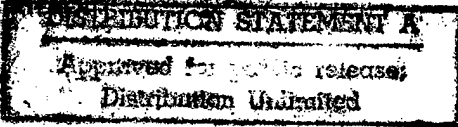


# REPORT DOCUMENTATION PAGE

Form Approved  
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Washington Headquarters Service, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE October 29, 1998	3. REPORT TYPE AND DATES COVERED Final	
4. TITLE AND SUBTITLE Final Technical Report <u>The Virtual Company Program</u>			5. FUNDING NUMBERS  N00014-97-1-0465	
6. AUTHOR(S)  Alexandra Amedro, Ph.D.				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)  West Virginia High Technology Consortium Foundation 1000 Technology Drive, Suite 1000 Fairmont, WV 26554			8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)  Office of Naval Research, Chicago Regional Office Federal Building, Room 208 536 South Clark Street Chicago, IL 60605-2509			10. SPONSORING / MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES				
11. DISTRIBUTION / AVAILABILITY STATEMENT 			12. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words)  Phase IV activities facilitated the expansion and privatization of the Virtual Company Model from small machine shop operations to a variety of other applications. The development of standards-based and adaptable systems afforded the US Navy the opportunity to take advantage of emerging technologies while providing the capability to evolve with changing mission requirements through sharing of software resources. This effort also included the evaluation by machine shop owners of the effectiveness of the Virtual Company manufacturing model. Virtual Company Phase IV leveraged the product line concept investigated by the USAF and NASA and determined its viability for the Navy. One major event that took place during this phase of the Virtual Company project is the Virtual Company conference in October 9, 1997. This conference addressed the evolution of the Virtual Company Model. Educational activities continued to play an important role in the Virtual Company project and they were accomplished by the sponsoring of the Federal Acquisition and Assistance Certificate classes with an emphasis on Virtual Company practices. Another educational project was the development of a computerized tutorial on the acquisition process to provide Virtual Company managers with a realistic knowledge of the laws, statutes, and processes governing federal and commercial acquisition procedures. One major accomplishment during Phase IV activities of this program was the creation of the VCLink.				
14. SUBJECT TERMS			15. NUMBER OF PAGES 11	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT  Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE  Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT  Unclassified	20. LIMITATION OF ABSTRACT	



# **West Virginia High Technology Consortium Foundation**

## **Virtual Company Distributed Manufacturing Demonstration Program**

### **FINAL TECHNICAL REPORT**

**Grant No. 00014-97-1-0465  
Phase IV of the Virtual Company Program**

**Presented to**

**The  
Department of Navy  
Office of Naval Research**

**October 31, 1998**

**West Virginia High Technology Consortium Foundation  
1000 Technology Drive, Suite 1000, Fairmont, WV 26554 – Phone (304) 363-5482 – Fax (304) 363-5982**

**DTIC QUALITY INSPECTED 4**

# **Virtual Company Distributed Manufacturing Demonstration Program**

**ONR GRANT NO: 00014-97-1-0465**

## **Final Technical Report**

### **Introduction**

The following information summarizes the activities that took place under ONR Grant No. 00014-97-1-0465. Performance period of the Grant was March 1, 1997 until July 31, 1998. The total value of the award was \$3,000,000. Many of the activities discussed below have already been reported on in detail in earlier exclusive reports; the following merely synthesizes many of those activities.

Phase IV activities facilitated the expansion and privatization of the Virtual Company Model from small machine shop operations to a variety of other applications. The development of standards-based and adaptable systems afforded the US Navy the opportunity to take advantage of emerging technologies while providing the capability to evolve with changing mission requirements through sharing of software resources. This effort also included the evaluation by machine shop owners of the effectiveness of the Virtual Company manufacturing model. Virtual Company Phase IV leveraged the product line concept investigated by the USAF and NASA and determined its viability for the Navy. One major event that took place during this phase of the Virtual Company project is the Virtual Company conference in October 9, 1997. This conference addressed the evolution of the Virtual Company Model. Educational activities continued to play an important role in the Virtual Company project and they were accomplished by the sponsoring of the Federal Acquisition and Assistance Certificate classes with an emphasis on Virtual Company practices. Another educational project was the development of a computerized tutorial on the acquisition process to provide Virtual Company managers with a realistic knowledge of the laws, statutes, and processes governing federal and commercial acquisition procedures. One major accomplishment during Phase IV activities of this program was the creation of the VCLink.

#### **1. March, April and May of 1997.**

- After the award of Phase IV on March 1, 1997, the Virtual Company team developed a management plan to document planned activities for Phase IV.
- During the first month of activities, the Virtual Company team drafted for release several solicitations for Manufacturing, best practices and technology transfer activities that were awarded in April.

19981104 001

- The Virtual Company Program initiated several projects such as the Virtual Company Experience Factory (VCEF) and the Update of the Network and Information Infrastructure to improve communication among VC member teams.
- A short CD demo on the Virtual Company program was exhibited at the Teaming to Win conference in May 15 and 16, 1997.
- Technology Transfer activities were underway with the presentation of a paper on Virtual Company operations at the Small Business and Manpower Support Contracting Conference at Dayton, Ohio.
- The Virtual Company Program released two solicitations for the Virtual Company Conference and the Virtual Company Product Line project.
- A program management review was accomplished on May 15 with Dave Rossi, Paul Rispin, Ted Lynch and representatives from Global, MPL, Prologic, Lockheed and the WVHTC Foundation.

## **2. June, July and August of 1997.**

- During this reporting period, the Virtual Company Program technically evaluated several proposals for the Virtual Company Conference and the Virtual Company Federal Acquisition and Assistance Classes Solicitations. Also, one proposal was received in response to the Virtual Company Product Line Solicitation.
- The Virtual Company Manufacturing Solicitation was released on June 13, proposals were due on July 15, 1997. Seven proposals were received for the evaluation of the Virtual Company Model in the manufacturing arena as well as the implementation of Virtual Company Quality systems and the effectiveness of the Robert C. Byrd Institute' statewide 21<sup>st</sup> Century Manufacturing Network.
- In the field of Technology Transfer activities we continued the development of a kiosk that contains information on the Virtual Company program. This kiosk was placed in the lobby of the WVHTC Foundation.
- The Virtual Company conference was scheduled for October 9, 1997 as an in-house project. Two purchase orders were awarded to women-owned companies for senior level support for the Virtual Company conference.
- Proposals for the Virtual Company Federal Acquisition and Assistance Classes program were evaluated and three awards were made by mid-August.
- Lockheed submitted a final version of the Concept of Operations document by mid-August.

- The Foundation also received two more purchase orders from OAO Robotics in response to our bids submitted to machine shops in June.
- The Virtual Company Federal Acquisition and Assistance Classes started in October for teaching seven modules of the Federal Acquisition and Assistance Program.
- The Foundation prepared a proposal for the continuing support of the Virtual Company program. The NavLAMP project focused VC implementation strategies in six different areas: advanced manufacturing, education, product line engineering, technology transfer, collateral strategies, and future planning. One of the primary goals of this project was to build a virtual company manufacturing organization that will perform at least \$1 million in manufacturing contracts.

### **3. September, October and November of 1997.**

- The Foundation announced the third series of its Certificate Program in Federal Acquisition and Assistance. This program was designed specifically for the Virtual Company Program, a program sponsored by the Office of Naval Research and the West Virginia High Technology Consortium Foundation. MG Associates, Jackson and Kelly and Acquisition Enterprises were the companies that submitted responsive offers in response to Solicitation No. WVHTC-F-VC97-1101. MG Associates taught the following classes: Federal Government Acquisition and Assistance, Cost Principles and Pricing, and Management of Contracts. Jackson and Kelly taught Contract Law. Acquisition Enterprises taught Negotiation and Subcontracting.
- The Virtual Company Conference: "Sharing Best Practices and Lessons Learned" was held on October 23, 1997 at the Alan B. Mollohan Innovation Center conference room in Fairmont, WV. With approximately 100 participants in attendance, the one-day conference funded by the Office of Naval Research marked its second annual gathering. The conference highlight was keynote speaker, Joseph R. Cleveland, Lockheed Martin's Enterprise Information Systems president. The speech was followed by three panel sessions regarding issues such as unique virtual company challenges, best practices in a virtual company environment and virtual company challenges from a corporate perspective. With heavy participation from the audience during each panel question and answer session, the day was closed with remarks from Thomas Hansberry, WVHTCF board member.
- A Program Management Review was conducted on October 3<sup>rd</sup>, with Ted Lynch and the Foundation to review Virtual Company Program status. Projects discussed at this meeting included: Prime Award Status, Subcontract Status, Virtual Company Conference, Certificate Program, the Virtual Company Lab, Virtual Company 3 Closeout, and the Manufacturing Grants.
- A Program Management Review was conducted with Mr. Paul Rispin, and representatives from Lockheed Martin, Tygart Technology, MPL Corporation, and the Foundation on October 22, 1997. Among some of the topics that were discussed

during this review were: ConOps and Guidebook by Lockheed, IT Infrastructure and Systems Integration by Tygart, Virtual Company Infrastructure Enhancement Project by MPL, Product Line Engineering by Prologic, Technology Transfer activities and Manufacturing Contracts by the Foundation.

- A task order #1086 was awarded to Tygart Technologies for the design of the Information Technology Infrastructure for the Virtual Company Information Systems, i.e., the VC HUB. The initial HUB will be operational by January 15, 1998.
- Prepared Product Line Engineering brief to be given to the Department of the Navy: Navy Undersea Warfare Center and Program Executive Officer for Cruise Missiles and Unmanned Aerial Vehicles.
- Met with Global Associates Ltd., on contract through the Office of Naval Research to support the WVHTC Foundation in the accomplishment of the Virtual Company project. The Virtual Company program manager provided Global with an overview of the VC project, the VC team and the objectives of this project. The discussion of the objectives led to the identification of three challenges:
  - Identify users of the VC service
  - Determine the time frame and the extent of Hub training
  - Determine the Measures of Effectiveness for the overarching goal and the individual objectives

Galaxy Global prepared a draft SOW and delivered it on November 5, 1997, and a final version on November 18, 1997.

- The Product Line team developed a first draft of the Pre-Adoption Report outline. This report clearly defines product-lines centered on Navy Program Offices, identifies aggressive champions, involves all the stakeholders of a product-line, and leverages legacy software and prior investments in tools, techniques, and processes.
- A contract award was made to each of three small manufacturing companies, Touchtone Research, CNC Machine and Aurora Flight Sciences, on November 13, 1997. These awards were the result of a competitive solicitation for the evaluation and implementation of Virtual Company practices and evaluation of the Robert C. Byrd Institute's statewide 21<sup>st</sup> Century Manufacturing Network.
- A Program Management Review was conducted on November 25<sup>th</sup>, with Ted Lynch, Norm Christensen, Roger Duckworth and Alexandra Amedro to review Virtual Company Program status. Projects discussed at this meeting included: The Virtual Company Concept of Operations Document, the VC Product Line Engineering (PLE) Project, the Information Technology Infrastructure for the Virtual Company, and the Global Associates, Inc. support to the Foundation in the accomplishment of the Virtual Company project.

- Briefed Product Line Engineering to the program manager for the Unmanned Aerial Vehicle Tactical Control System, Captain Mike Witte, of the Program Office for Cruise Missiles and Unmanned Aerial Vehicles. The Tactical Control Systems people were generally enthused and invited us to collaborate with their primary software engineering agent, Steve Parker, from the Naval Surface Warfare Center in Dahlgren, VA.
- Three CD-ROMS were created and delivered to the three small manufacturing companies for the evaluation of several Virtual Company tools:
  - Virtual Company Concept of Operations
  - Contract Templates
  - Proposal Preparation Checklist
  - Generic Quality Manual
  - Manufacturing Process, Document Flow Specification
  - Document Management System in a Virtual Corporation: *Architectural Design*.
- Initiated work on the Virtual Company Product Line Pre-Adoption Report and the Virtual Company Product Line Issues Report.
- Tygart Technologies presented recommendations for the Architecture of the Virtual Company Information Technology Infrastructure System.

#### **4. December of 1997, January and February of 1998.**

- Two strategic planning sessions were conducted with the VC Program Management team and VC contractors supporting the instantiation of the VCLink. These sessions focused on identifying and prioritizing VCLink capabilities.
- Established VC operations on the net; address is <http://www.vclink.net>
- A Program Management Review was conducted on January 9th, with David Rossi, Dr. Paul Rispin, Ted Lynch, Norm Christensen, Roger Duckworth, and Jim Estep to review Virtual Company Program status. Ken Lyndsey, Chief Technical Officer, RCBI was an invited guest. Projects discussed at this meeting included:
  - Development of the Virtual Company Best Practices System
  - Test and Evaluation of the Virtual Company Manufacturing Environments
  - Incorporation of Product Line Engineering Activities into the Virtual Company Model
  - Virtual Company Technology Transfer Activities:
  - Virtual Company Model Dissemination
  - Update of the Networked Communications/Operations Infrastructure
  - National Virtual Company Conference and Exhibition
  - Educational Initiatives:
  - Computerized Tutorial Development

- Federal Acquisition and Assistance Certificate Program
- Met with Tygart, MPL and Prologic which have partnered to form a Virtual Company to expand the capabilities of the VCLink. Legal assistance was provided at this meeting by Eddie Parker, lawyer from Jackson and Kelly.
- Contacted Dr. Bud Forrester to be the speaker for the VC Link Symposium on March 12, 1998. He is the Vice President for Land Combat Systems, Electronic Sensors and Systems Division for Northrop Grumman Corporation. He retired from the Army as a Lieutenant General and holds a Ph.D. in Nuclear Physics.
- Finalized education and training needs survey for affiliate/manufacturing companies. The purpose of this survey was to determine the community training needs. Training areas outlined in the survey were:
  - Business Software
  - Business Development
  - Virtual Company Program
  - Federal Acquisition and Assistance
  - Management
  - Miscellaneous

The VCLink education/training section will identify opportunities to meet these needs.

- Briefed ProLogic on Unmanned Aerial Vehicles in preparation for upcoming Product Line Engineering efforts with the Program Executive Office for Cruise Missiles and Unmanned Aerial Vehicles.
- A Virtual Company Program Management Review was conducted on February 19<sup>th</sup>, with Ted Lynch, Norm Christensen, Roger Duckworth, and Alexandra Amedro. Projects discussed at this meeting included:
  - Financial review of Virtual Company Phase IV and V
  - Test and Evaluation of the Virtual Company Model in Manufacturing Environments
  - Incorporation of Product Line Engineering Activities into the Virtual Company Model
  - Virtual Company Technology Transfer Activities:
  - Virtual Company Link
  - Symposium, March 12, 1998
  - National Virtual Company Conference and Exhibition targeted for October, 1998
  - Educational Initiatives:
  - Computerized Tutorial Development
  - Federal Acquisition and Assistance Certificate Program
  - Training Survey



- Mailed 400 invitations to WV manufacturing companies and WVHTC Foundation affiliate members for the inauguration of the Virtual Company Link on March 12, 1998.
- Received forty-one answers to our training interests' survey located in the VCLink homepage, from affiliate/manufacturing companies.
- Met with Mr. David Rossi and Ted Lynch in Washington, DC. Projects discussed at this meeting included:
  - Product Line Engineering additional funding
  - Extension of VC-IV funding
  - Realignment of VC-V funding

#### **5. March, April and May of 1998.**

- Inaugurated the Virtual Company Link on March 12, 1998.
- Developed content and layout for the VCLink brochure, 300 copies were made.
- Reviewed and modified the Virtual Company Life Cycle to be included in the VCLink.
- Reviewed, modified and submitted Contract and Proposal templates for inclusion on the VCLink.
- Met with Strike Warfare Software managers to discuss implementation of Product Line Engineering for Tactical Control Systems and ATWCS.
- Met with Agility Forum executives and Maritech Agile Shipbuilding Toolkit (MAAST) program staff at Lehigh University in Bethlehem, Pennsylvania.
- Met with executive at the Ben Franklin Technology Center to review their involvement in agile manufacturing within Pennsylvania.
- Attended Product Line Issues Action Team Conference in Arlington, Va.
- Contacted 20 manufacturing and information technology companies to be part of a Steering committee re design issues with the VCLink databases. The following companies attended this luncheon/Strategic Planning Session on April 29, 1998. D. N. American, Augusta Computer Services, EMT Associates, Electronic Warfare Associates, MPL, Prologic, Tygart Technology, Intermetrics, Inc., CNC Industries, Nimbl Associates, Aurora Flight Sciences of WV, Inc., and TMC Technologies.

- The Foundation's facilities, property, personnel and award management manuals and procedures were sanitized and included in the VCLink homepage.
- Met with the Regional Small Business Development Center to co-sponsor a "Business Development" workshop, one of the most wanted classes from the Training Interests Survey results. This workshop is scheduled for October 1, 1998.
- Met with the Idaho National Engineering and Environmental Laboratory (INEEL) personnel and reached preliminary agreement on using the VCLink homepage as a Beta site for their CAD/CAM internet capability.
- A Program Management Review was conducted on April 9th, with Ted Lynch, Norm Christensen, John Gaddis, and Alexandra Amedro to review Virtual Company Program status. Projects discussed at this meeting included:
  - Financials of VC-IV and VC-V
  - Test and Evaluation of the Virtual Company Model in Manufacturing Environments
  - Incorporation of Product Line Engineering Activities into the Virtual Company Model
  - Virtual Company Technology Transfer Activities:
  - New "look-feel" VCLink homepage
  - Virtual Company Model Dissemination
  - Educational Initiatives:
    - Computerized Tutorial Development (demo)
    - Federal Acquisition and Assistance Certificate Program

## **6. June and July of 1998.**

1. Held Program Management Review with David Rossi, Dr. Paul Rispin, Captain Mike Witte, Mark Dady, Steve Parker, Robert Fondren, Penny Pierce, Ted Lynch, Norm Christensen, John Gaddis and Roger Duckworth on June 5 at Patuxent River Naval Air Station. Topics discussed at this meeting included:
  - Virtual Company Best Practices System,
  - Test and Evaluation of the Virtual Company Model in Manufacturing Environments, and
  - Virtual Company Technology Transfer Activities.
- Held pre-proposal conference on June 3, 1998 at the National Guard Armory in Gassaway, WV. Three manufacturing companies attended this conference: J&S Machine Co.; CAM & Associates; and NIMBL. The final RFP was released on June 12, 1998 and proposals were due on July 13, 1998.

- Held Program Management Review with Ted Lynch, Norm Christensen, John Gaddis, Cahty Rotunda, and Alexandra Amedro on July 21, 1998. Topics discussed at this meeting included:
  - Virtual Company Best Practices System,
  - Test and Evaluation of the Virtual Company Model in Manufacturing Environments, Virtual Company Technology Transfer Activities, and
  - Educational initiatives.
- Created a VCLink Configuration Change Control Board (CCCB) to discuss policies, technical and administrative topics before any major change and/or alteration is made to the VCLink Information Management System. A problem/change request/report system was implemented to track any request. This system is "world wide web" based. Requests are to be entered into this system by the requester. The request will be reviewed and given 1) priority status, 2) tracking number, and 3) request tracking data. Major changes require an estimate of implementation time, cost, and impact to overall schedule. These will require the Program Manager's signature.
- Met with George Caddy from Concurrent Technologies regarding the design of an "Enterprise Solutions Workshop" to be held in January, 1999. This workshop is co-sponsored by PTAC/RCAC/CTC and the WVHTCF. A survey will be developed to find out the business community interests in order to customize this workshop to their needs. Among some of the tracks that we could follow are: Managerial/Financial Accounting, Quality Development/Planning/Maintenance, Marketing & Sales, Human Resources, Production Scheduling/Work Flow Control & Inventory and Product Development.
- Initiated marketing plan with West Virginia University (WVU) to obtain high level of participation by community companies in joining the VCLink. WVU developed a marketing questionnaire and it was mailed directly to several hundred businesses.

## Conclusion

The WVHTC Foundation realized many successes during this phase of the Virtual Company Demonstration Manufacturing project. Overall the project is on line and proceeding forward. Phase V will continue many of the initiatives started under Phase IV such as:

- VCLink marketing initiatives
- Virtual Company Manufacturing initiatives
- Company Profile Database
- Resume Database
- Online Event registration
- Secure Proposal Development
- Workflow Support
- Opportunities Search Views

- Chat Rooms
- And much more!